We claim:

1. A process for synthesis of ultrafine rutile phase titanium dioxide particles through vapor phase hydrolysis of titanium tetrachloride comprising the step of:
   (a) hydrolyzing a mixture of $TiCl_4$ and H_2O and a dopant in vapour phase in an aerosol reactor;
   (b) collecting amorphous or anatase titanium dioxide powder formed as dry powders;
   (c) calcining the dry powder to obtain rutile phase titanium dioxide.
2. A process as claimed in claim 1 wherein the amorphous particles of titanium dioxide are calcined at a temperature in the range of 150 to 400°C and for a period in the range of 1 to 4 hrs to generate rutile particles.
3. A process as claimed in claim 1 wherein the dopant contains a carbon atom and is selected from the group consisting of an aliphatic alcohol, an aromatic hydrocarbon, and any mixture thereof.
4. A process as claimed in claim 3 wherein the dopant is ethanol.
5. A process as claimed in claim 1 wherein the molar concentration of the dopant is 1 to 10 based on the water vapour.
6. A process as claimed in claim 1 wherein the reaction mixture contains from 1 to 10 % ethanol on a molar basis based on $TiCl_4$.
7. A process as claimed in claim 1 wherein the flow rate of $TiCl_4$ is in the range of 10 cm^3/min to 200 cm^3/min.
8. A process as claimed in claim 1 wherein the $TiCl_4$ vapor concentration inside the reactor is in the range of 7×10^{-4} mol/min to 1×10^{-2} mol/min.
9. A process as claimed in claim 1 wherein the flow rate of water vapour is in the range of 240 to 1500 cm^3/min, preferably from 500 to 1000 cm^3/min.
10. A process as claimed in claim 1 wherein the temperature at the exit of the aerosol reactor is maintained at less than 100°C for obtaining titanium dioxide particles having anatase phase.
11. A process as claimed in claim 1 wherein the aerosol reactor is externally heated in order to avoid particle coating on the walls through thermophoresis.
12. A process as claimed in claim 1 wherein the aerosol reactor comprises of 3 – tube concentric jet assembly wherein $TiCl_4$ is introduced into the innermost tube, dopant is introduced into the outermost tube and water vapor is introduced into the middle tube.
13. A process as claimed in claim 12 wherein the 3-tube assembly comprises a concentric arrangement of three inconel tubes at the entrance of the aerosol reactor.

14. A process as claimed in claim 12 wherein vapor phase $TiCl_4$ is introduced into a center tube of the three concentric inconel tubes.

15. A process as claimed in claim 1 wherein the vapor phase $TiCl_4$ is formed by bubbling an inert gas through $TiCl_4$ liquid.

16. A process as claimed in claim 1 wherein the inert gas is selected from the group consisting of argon, nitrogen, krypton, helium and any mixture thereof.

17. A process as claimed in claim 1 wherein the molar ratio of water to titanium tetra chloride in the feed is in the range 10 to 15.

18. A process as claimed in claim 1 wherein the water vapor is formed by bubbling air or inert gases through water under superheated condition.

19. A process as claimed in claim 1 wherein the reactor wall temperature is from 200 to 450°C.

20. A process as claimed in claim 1 wherein the rutile titanium dioxide particles formed have an average diameter in the range of from 25 to 150 nanometers.

21. A vapor phase process for the synthesis of ultrafine rutile titanium dioxide powders carried out in an aerosol reactor comprising the steps of:

(a) vaporizing a titanium chloride liquid, water and dopant such as ethanol separately for generating a reactant mixture;

(b) hydrolyzing $TiCl_4$, H_2O and dopant in vapour phase mixture in a continuous aerosol reactor under non-isothermal conditions at temperature in the range 80 to 135°C;

(c) collecting amorphous and anatase phase titanium dioxide powder as dry powder;

(d) calcining the titanium dioxide particles having the amorphous phase in the temperature ange of 150-400°C and time duration in the range of 1 to 4 hrs. to obtain titanium dioxide particles with rutile phase.